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248. Proposed by S. A. COREY, Hiteman, Iowa.

Prove that $\frac{6435}{2} \cdot \frac{161280^2}{929569} \left[1 + \frac{1}{3^{16}} + \frac{1}{5^{16}} + \frac{1}{7^{16}} + \dots \right] = \pi^{16}$.

249. Proposed by J. J. KEYES, Fogg High School, Nashville, Tenn.

Solve $x + y + z = 5$, $x^2 + y^2 = z^2$, $x^3 + y^3 + z^3 = 8$.

AVERAGE AND PROBABILITY.

173. Proposed by J. EDWARD SANDERS, Reinersville, Ohio.

A chord of length c is drawn at random in a given ellipse. What is the average area of the segment cut off by the chord?

CALCULUS.

209. Proposed by J. EDWARD SANDERS, Reinersville, Ohio.

A thread makes $n(=30)$ equidistant spiral turns around a rough cone whose altitude is $h(=10)$ feet, and radius of base $r(=11)$ inches. How far will a bird fly in unwinding the thread if the part unwound is at all times perpendicular to the axis of the cone?

210. Proposed by EDWIN L. RICH, Schenectady, New York.

Determine a polynomial, $f(x)$, entirely in x and of the seventh degree, so that $f(x) + 1$ is divisible by $(x-1)^4$ and $f(x) - 1$ by $(x+1)^4$. [Goursat-Hedrick, *A Course in Mathematical Analysis*, p. 32, Ex. 3.]

211. Proposed by R. D. CARMICHAEL, Hartselle, Ala.

If $x = v^{1/(v-1)}$, what is the $f(x)$ such that $v = f(x)$?

DIOPHANTINE ANALYSIS.

130. Proposed by W. J. GREENSTREET, M. A., Editor of the *Mathematical Gazette*, Stroud, England.

In how many ways may a number of which the prime factors are known, be expressed as the sum of two or more consecutive numbers?

131. Proposed by DR. O. E. GLENN, Drury College.

Devise a method of finding the cubic residues of a number, analogous to Gauss's "Method of Exclusion" for quadratic residues.

GEOMETRY.

274. Proposed by R. D. CARMICHAEL, Hartselle, Ala.

If a straight line AB is placed between two intersecting straight lines MN and PQ and is made to revolve through all possible positions having A always in MN and B always in PQ , what is the locus of any point L in AB or AB produced?

275. Proposed by PROFESSOR WILLIAM HOOVER, Ph. D., Athens, Ohio.

An hyperbola is drawn touching the axes of an ellipse, and the asymptotes of the hyperbola touch the ellipse. Prove that the center of the hyperbola lies on one of the equal conjugate diameters of the ellipse.

276. Proposed by G. I. HOPKINS, Manchester, N. H.

ABC is an equilateral triangle whose vertices are the centers of circles with radius AB , and H is the center of the arc AB . From F , the point of intersection of the circles whose centers are A and C , a line is drawn through H to the circumference CAN . Draw BN , and prove that the angle ABN is an angle of a regular pentagon.

MECHANICS.

186. Proposed by R. D. CARMICHAEL, Hartselle, Alabama.

A point P keeps at uniform distance from and moves with uniform angular velocity around a point Q which is in harmonic motion, making one revolution while Q swings to and fro. If P is in the line of the path of Q and on the same side of the center of that path with Q when Q is at the extremity of the path, what is the locus of P ?

UNSOLVED PROBLEMS.

NOTE. The following problems still remain unsolved (in our columns).

Algebra, 179. Proposed by DR. L. E. DICKSON, The University of Chicago.

Find the roots of the algebraically solvable quintic equation

$$x^2 + qx^2 + px + \frac{1}{5} \left[\frac{q^2}{p} - \frac{p^3}{5q} \right] = 0.$$

Geometry, 267. Proposed by W. W. LANDIS, Dickinson College, Carlisle, Pa.

Prove that every orthogonal system of circles is an isothermal system.

Group Theory, 9. Proposed by DR. L. E. DICKSON, The University of Chicago.

Does there exist a triply transitive group on m letters of order $m(m-1)(m-2)$ other than the linear fractional group in the Galois Field of order $p^n = m-1$ and the group 720_3 on ten letters (Cole, *Quarterly Journal*, 1895, p. 44)? This question relates to Problem 99, MONTHLY, March, 1900.

Miscellaneous, 151. Proposed by W. J. GREENSTREET, M. A., Stroud, England.

$$\text{Sum the series } \sum_{r=1}^{r=m} \operatorname{cosec} \left[\frac{2r-1}{4m} \pi + \theta \right] \operatorname{cosec} \left[\frac{2r-1}{4m} \pi - \theta \right].$$